

Transportation Technology

TTP 210-001 (CRN 51521)

Course Details:

Quarter:	Fall 2020
When:	MW 4:10-6:00 (Recordings will be made available after class)
Instructor:	Rosa Dominguez-Faus (rdominguezfaus@ucdavis.edu)
Eligibility:	Graduate level
Classroom:	2120B Wickson Hall (zoom during COVID)
Office Hours:	By appointment.
Number of Units:	4
Grading:	Letter graded

Course Description:

This course covers the fundamentals of transportation technology: How the technology works and how we evaluate this technology. Topics include Engines and Drive Trains across different transportation modes and segments, Fuels and Fuel Pathways, Emissions and After-treatment technologies, Efficiency and the fundamental forces ($f=ma$, friction, drag, basic thermodynamics) that affect it, Electricity (AC/DC, sources of generation, charging, how the grid operates), Batteries and other forms of energy storage, Recycling and Waste Management. We will learn methods to evaluate technology, such as well-to-wheels Life Cycle Analysis, Total Cost of Ownership models, Fleet Turnover Models, Cost/benefit Analysis. We will review examples of data collection technology such as GPS to collect location data, technologies, who is collecting it, and discuss technologic and ethical issues around it. This is not an engineering course. It presents a perspective on technology that is useful for understanding and addressing problems, without the hard math. We aim to understand how the technology works in different contexts, what are the strengths, the limitations, and the challenges of these technologies. What the tradeoffs are. This course will prepare the student for a research and/or decision-making career in industry, academia, non-profit, or government. This is emphasized through case studies of the interface between policy and science and homework questions and class examples specifically geared toward the understanding of technical vs. political difficulties and the interface between them.

Prerequisites:

None. This class is organized so students with different backgrounds can take it. If you know the difference between a car and a truck, you will be able to follow.

Course requirements:

1. Course participation: Students are required to actively participate in class discussion. During COVID times, this means attending virtual or prerecorded class and interacting synchronously or asynchronously.
2. Homework: There will be four assignments (worth 15% of the grade each). Students will apply knowledge gained in this course to real world problems researchers and practitioners in transportation might encounter. The homework will be worth 60% of the total.

3. Mid-term exam/project presentation: I am still undecided whether an exam or presentation is the best way during COVID times. Students can work in groups or individually to investigate and present on one of the topics discussed to this point. This project/exam will be worth 15% of the total grade
4. Final exam/project presentation: Students can work in groups or individually to investigate and present on one of the topics discussed to this point. This project/exam will be worth 15% of the total grade

Readings

No textbook. All readings will be posted in Canvas. The readings are organized by the date they will be discussed in class.

Grading:

Homework	60%
Mid-term project presentation/exam	15%
Final project presentation/exam	15%

Assignments:

There will be four different homework assignments, spaced throughout the quarter, with contribute 15% each to the grade. Late homework will be accepted with points deducted (25% deduction within 1 week, 50% deduction the next week).

Mid-term exam or Project:

The mid-term project will be similar to the assignments but larger in scope.

Final exam or Project

The final project will be similar to the assignments but larger in scope.

Plagiarism:

"Plagiarism" means using the words or ideas of another without giving appropriate credit. Even if the student paraphrases the ideas in his/her own words, the source must be cited. If exact words are used, the student must put the words in quotation marks and cite the source. Students are responsible for knowing what plagiarism is and avoiding it. Be careful about copying and pasting information from the Internet - materials used from Internet sources must be quoted and cited just like information from other sources. This websites are available to help you determine when citations are appropriate and to avoid accidental plagiarism (e.g., <http://sja.ucdavis.edu/files/plagiarism.pdf>). Take a moment to familiarize yourself with the [Code of Academic Conduct](#)

UC Davis Student Disability Center:

The University of California, Davis is committed to ensuring equal educational opportunities for students with disabilities. UC Davis has policies regarding disability accommodation, which are administered through the Student Disability Center (<https://sdc.ucdavis.edu/>).

Students are responsible for contacting each of their instructors in advance to ensure appropriate arrangements are made for requested accommodations. Please visit the Center website for more information.

Schedule

	Date	Title	Assignments
Part 1: Introductory concepts	9/30	Intro to class and to transportation sector and segments, emissions, VMT and other major metrics.	
	10/5	How we evaluate technology: Understanding type and amounts of pollution	
	10/7	How we evaluate technology: Methods	
	10/12	Diffusion of innovation + Technology adoption + Social construction of technology	
Part 2 LD Vehicles and Fuels	10/14	Types of engines and drive trains	HW1 due
	10/19	Energy pathways side by side	
	10/21	Liquid fuels: Gasoline, Diesel and Biofuels (E15, E85, Biodiesel, Green Diesel, etc)	
	10/26	Gaseous fuels: Natural gas, Renewable natural gas (Hydrogen will come later)	
	10/28	Batteries and EVs (PHEV, BEV)	HW2 due
	11/2	Electricity and Grid (AC/DC, sources of generation, grid...)	
	11/4	FCV and Hydrogen	
	11/9	Mid-Term or Project Presentations	Mid-term
	11/11	Veterans Day	
Part 3: Software-based Tech.	11/16	Connected and Autonomous Vehicles (CAV)	
	11/18	On-demand mobility/Ridehailing	
	11/23	Data collection technology. GPS to collect location data, technologies, who is collecting it,	
	11/25	Micromobility – state of the technology, outlook, issues	
Part 4: Non-LDV systems	26-27 Nov	Thanksgiving Holiday	HW3 due
	11/30	Intro to Rail Systems	
	12/2	Intro to Freight	
	12/7	Intro to Transit	
	12/9	Intro to Marine Freight and Air travel	HW4 due
	14-16 Dec	Week of examinations-Final or project presentations	Final
	12/18	Quarter ends	